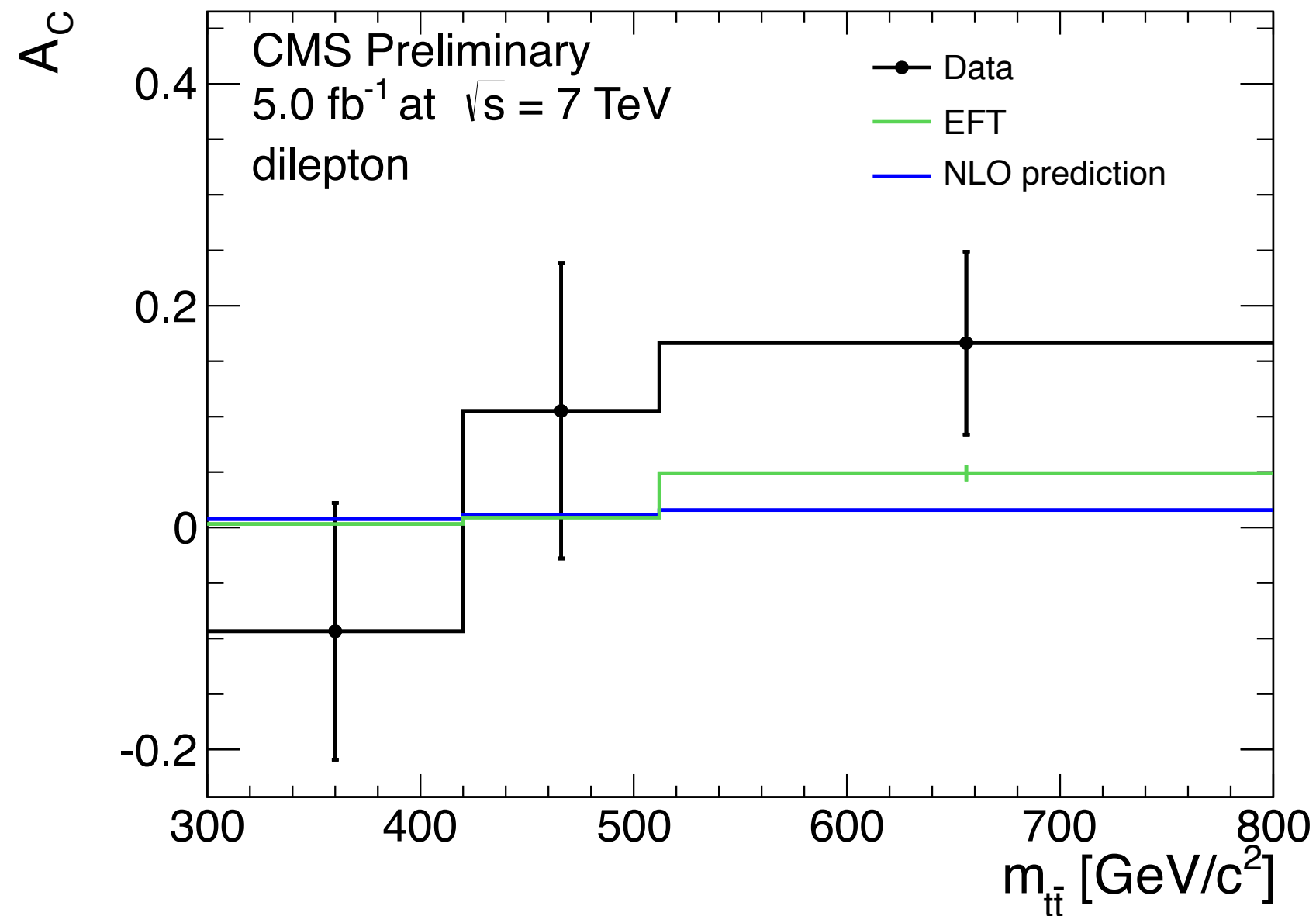


TOP-12-010: Comparing the M_{tt} dependence of the two analyses

Sergo, Yanjun & Jacob

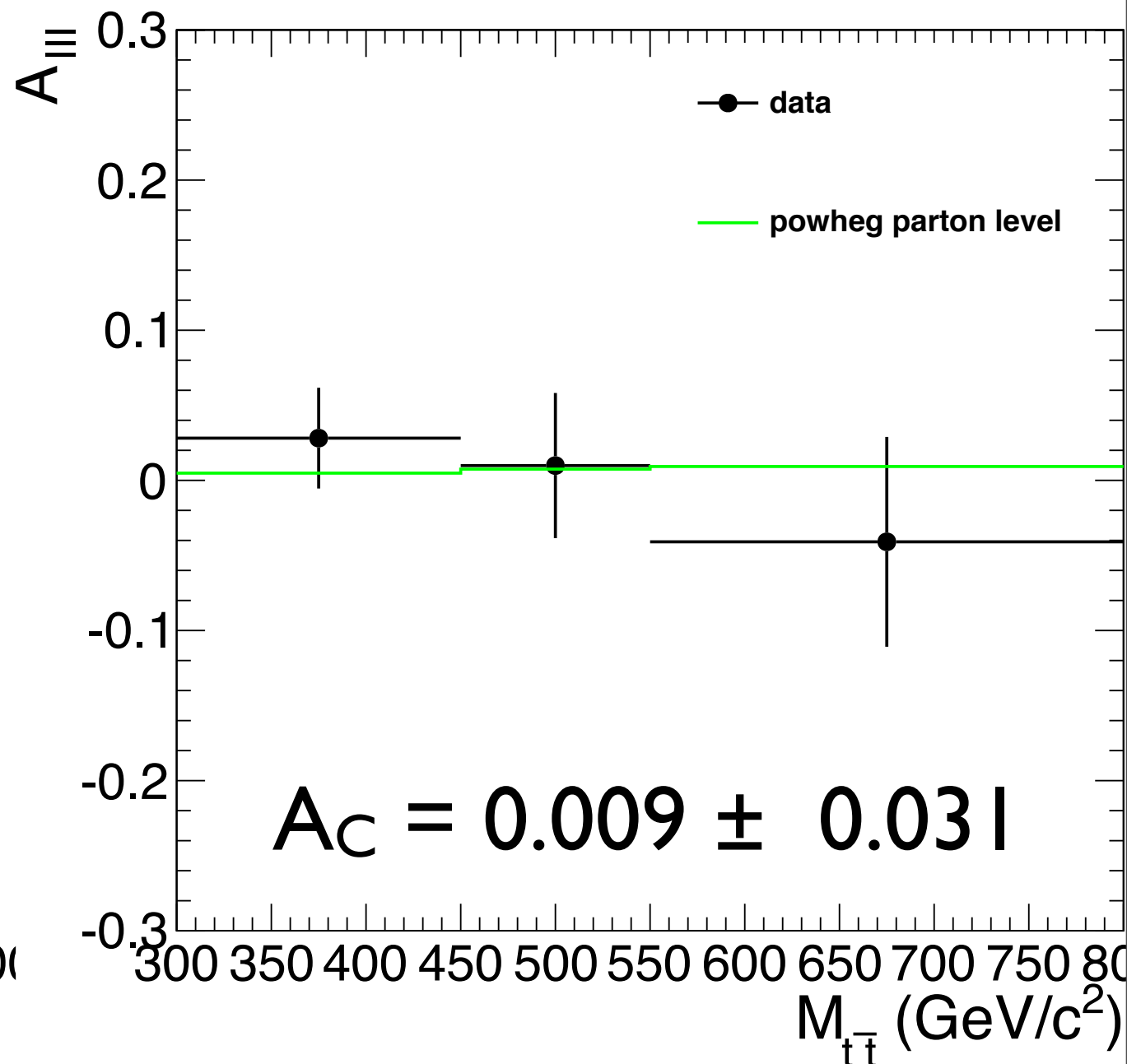
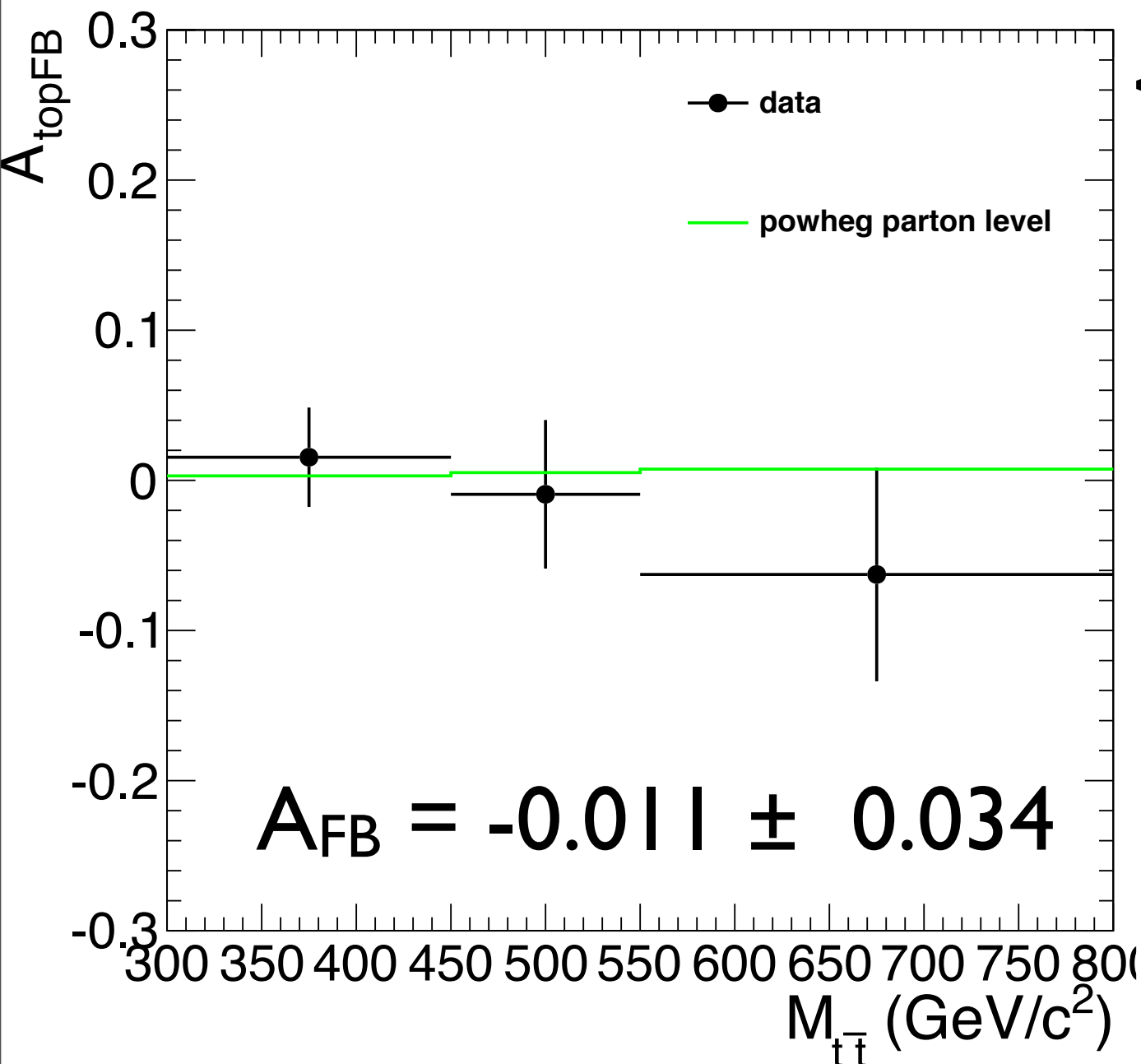
- We were asked to investigate what causes the difference in M_{tt} dependence between the two analyses
 - <https://hypernews.cern.ch/HyperNews/CMS/get/TOP-12-010/8.html>
- Plots from the PAS on next two slides as a reminder:
 - Marco's result shows a rising trend in A_C vs M_{tt}
 - Our result shows a falling trend in A_{FB} vs M_{tt}
 - But both results pretty consistent with flatness
- Also show our result for A_C
 - A_C and A_{FB} are strongly correlated, so we expect the M_{tt} dependence to be similar (see slide 7)
- Then we see how our result changes after adding 0 b-tag data to match Marco's selection

- Marco's results (plot from the PAS)
- uncertainties stat only



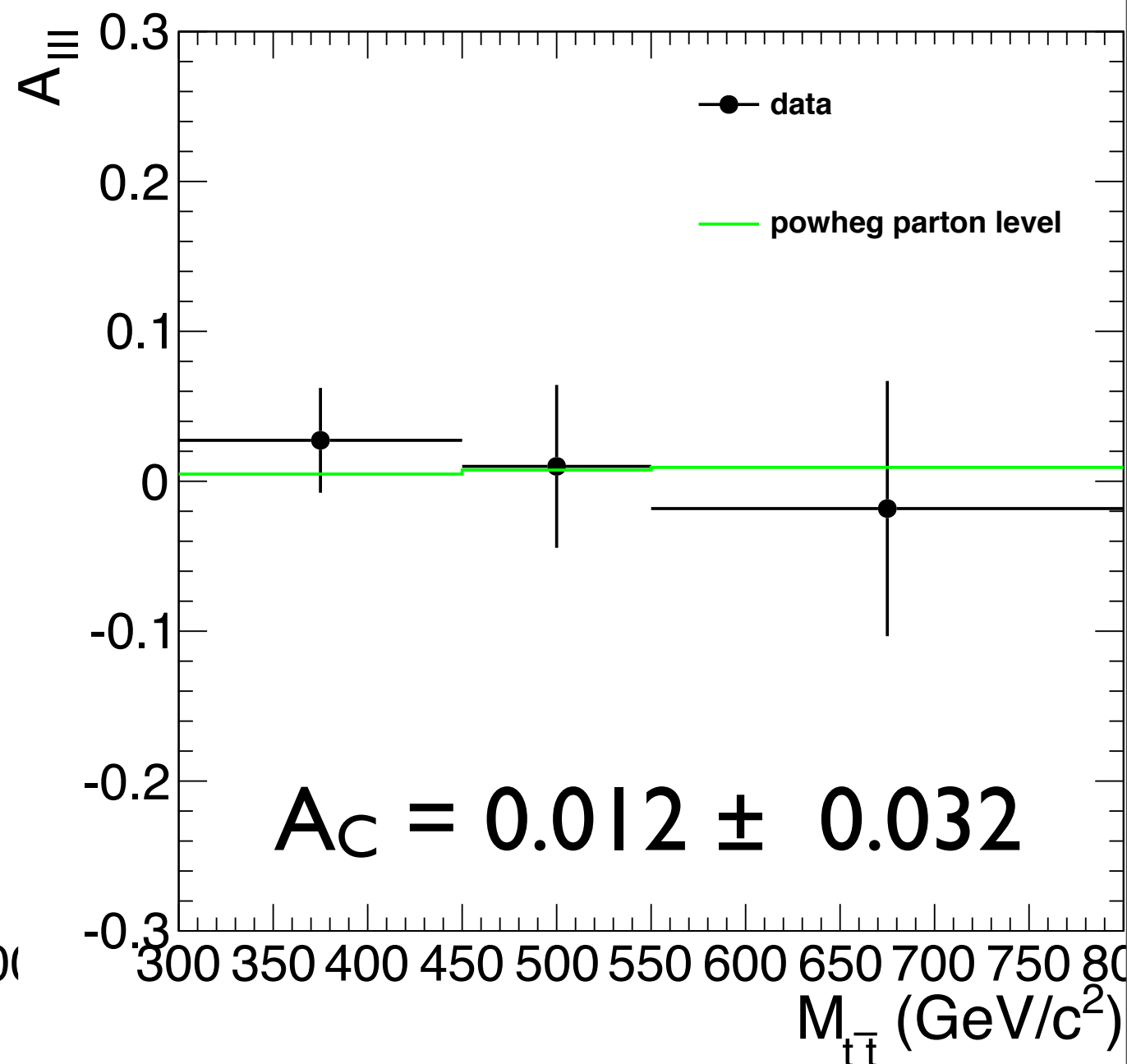
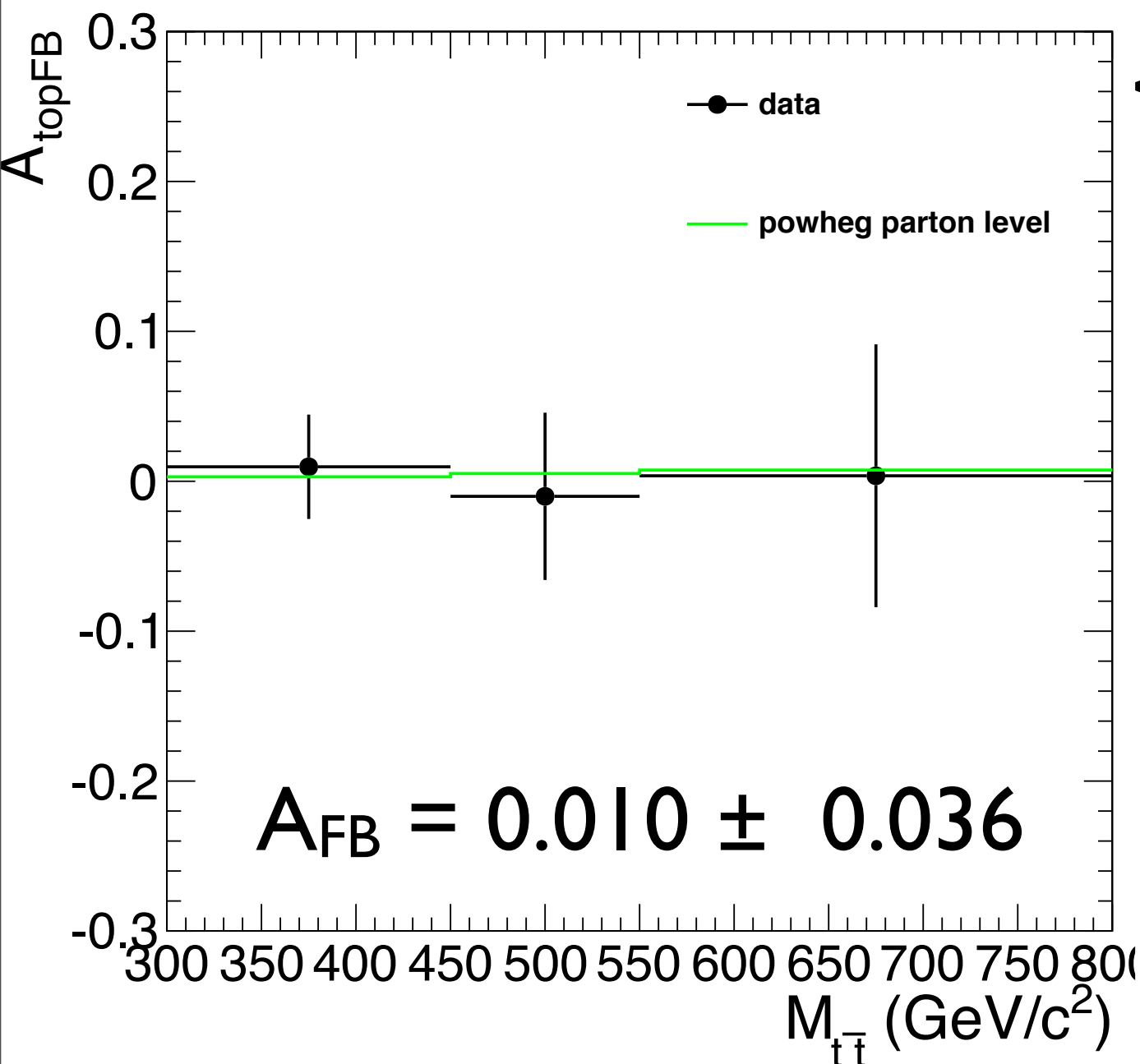
$$A_C = 0.050 \pm 0.043$$

- Our result for A_{FB} from the PAS is plotted on the left
- x axis changed to match Marco's, uncertainties stat only
- Result for A_{C} using same events and method is on the right
- A_{FB} and A_{C} results are consistent with each other



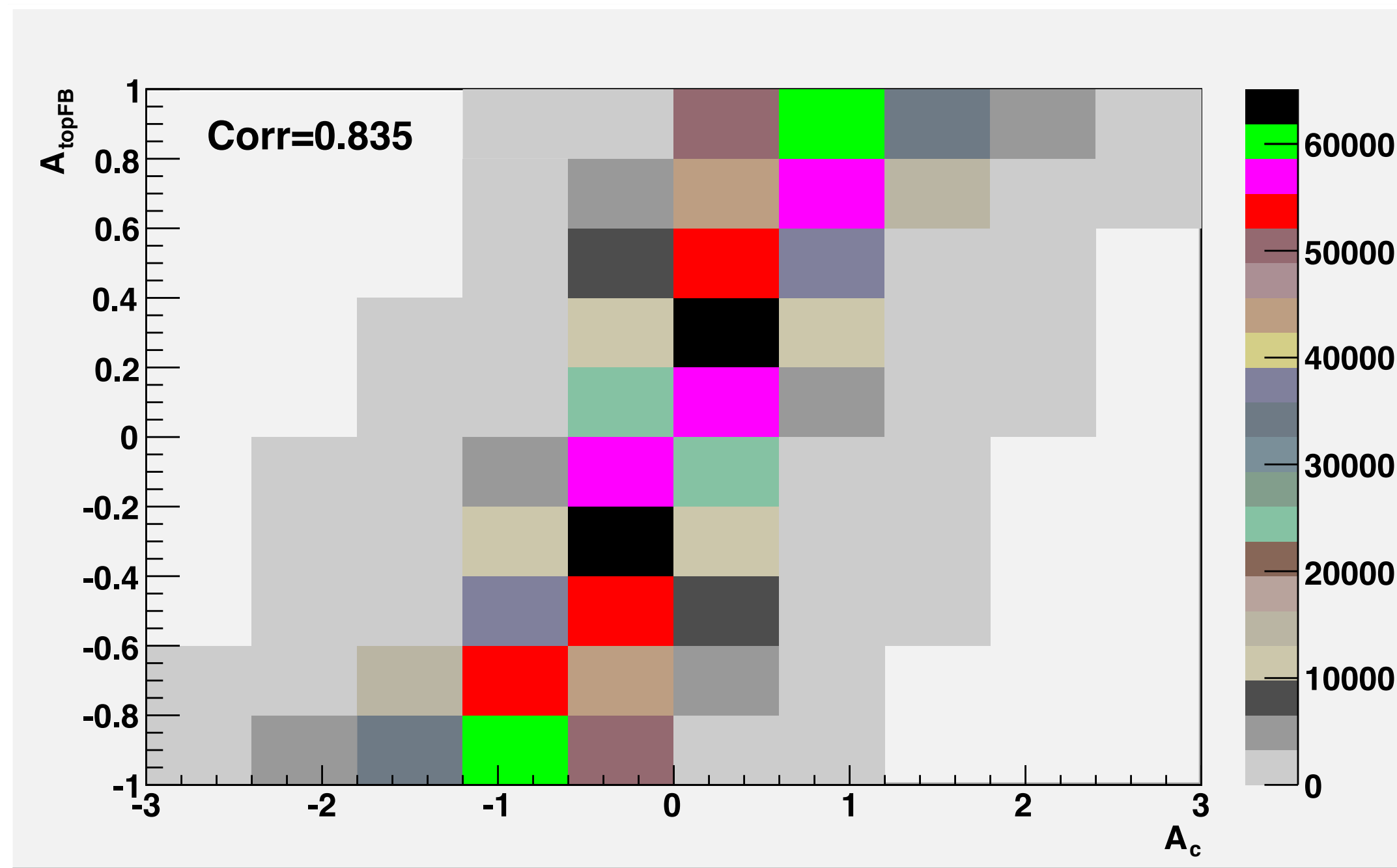
- Now add 0 b-tag data to our analysis, to match Marco's selection (our analysis requires ≥ 1 b tags)
- increases data yield by 49%
 - from 9746 to 14479
- ttbar->dl purity decreases a lot:
 - ≥ 1 btag has 92% ttbar->dl
 - ≥ 0 btags has 76% ttbar->dl
 - the 0 btag bin has low purity: 42% ttbar->dl (lots of DY)
- background subtraction a more important effect for ≥ 0 b-tag sample than for ≥ 1 b-tag sample

- Our results after adding events with 0 b-tags (compare slide 4)
 - we also stop using b-tagging info to choose jets
 - we use MC background predictions for subtraction
- The downwards trend is gone in A_{FB} , reduced in A_C



Correlation

- $\cos(\theta_t)$ vs $|y_t| - |y_{t\text{bar}}|$ at gen level (variables used for A_{FB} and A_c)
- Strongly correlated ($\rho = 0.835$)



Conclusions

- A_C and A_{FB} results strongly correlated
- Adding 0 b-tag data increases total yield by $\sim 50\%$, but final result has larger stat uncertainty because 58% of the additional data is background
 - ≥ 1 b-tags: $A_C = 0.009 \pm 0.031$
 - ≥ 0 b-tags: $A_C = 0.012 \pm 0.032$
- Adding 0 b-tag data removes the negative slope in our result, but does not reproduce rising trend
 - results still not directly comparable due to differences in unfolding procedure, background estimation, binning, and remaining selection differences
 - but results consistent within ~ 1.5 sigma